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STUDIES OF SUGARCANE INSECTS CONDUCTED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE IN PUERTO RICO

BY

H. D. TATE AND F. M. WADLEY
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
UNITED STATES DEPARTMENT OF AGRICULTURE

INVESTIGATIONS OF SUGARCANE INSECTS AS PESTS IN PUERTO RICO WERE CONDUCTED BY THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE OF THE UNITED STATES DEPARTMENT OF AGRICULTURE FROM AUGUST 1935 TO JUNE 1936. THIS WORK, WHICH WAS MADE POSSIBLE THROUGH FUNDS FROM PROCESSING TAXES, WAS CARRIED ON IN COOPERATION WITH THE PUERTO RICO EXPERIMENT STATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE AT MAYAGUEZ.

THESE STUDIES COVERED TWO SEPARATE BUT RELATED PHASES, FIRST, A STUDY OF INSECT TRANSMISSION OF SUGARCANE MOSAIC DISEASE AND SECOND, A SURVEY OF THE DISTRIBUTION AND ABUNDANCE OF INSECTS, ESPECIALLY SUCKING INSECTS, IN AND AROUND SUGARCANE FIELDS.

SUGARCANE SEEDLINGS WERE USED IN TRANSMISSION EXPERIMENTS.

PLANTS PRODUCED FROM THE SEED FROM ARROWS OF MOSAIC-SUSCEPTIBLE VARIETIES OF SUGARCANE PROVED TO HAVE SEVERAL ADVANTAGES OVER PLANTS GROWN FROM CUTTINGS. MORE SEEDLING PLANTS THAN CUTTINGS WERE GROWN IN A LIMITED SPACE, AND THEY WERE MORE CONVENIENT TO HANDLE. FURTHERMORE, ALL SEEDLINGS WERE FREE OF MOSAIC AT THE START, WHEREAS IT COULD NEVER BE CERTAIN THAT CUTTINGS FROM SUSCEPTIBLE VARIETIES WERE FREE OF THE DISEASE.

THREE SPECIES OF APHIDS TRANSMITTED THE DISEASE IN THESE EXPERIMENTS.

PREVIOUS WORKERS HAVE SHOWN THAT THE CORN LEAF APHID, APHIS MAIDIS FITCH, AND A BROWN APHID, HYSTERONEURA SETARIAE THOMAS, FOUND ON CANE AND GRASSES CAN

TRANSMIT SUGARCANE MOSAIC FROM DISEASED TO HEALTHY PLANTS, BUT IT HAD NOT BEEN DEFINITELY DEMONSTRATED THAT OTHER SPECIES OF INSECTS ARE ABLE ALSO TO TRANSMIT THE DISEASE. IN THE WRITERS' TRANSMISSION EXPERIMENTS CORN LEAF APHIDS WERE CONFINED ON CANE HAVING MOSAIC, THEN TRANSFERRED TO HEALTHY CANE SEEDLINGS. OF OVER 140 SUCH SEEDLINGS EXPOSED, 35 PERCENT DEVELOPED MOSAIC. IN SIMILAR EXPERIMENTS, SPECIMENS OF THE BLACK APHID, CAROLINAIA CYPERI AINSLEY, OF SEDGE OR "COQUI", CYPERUS ROTUNDUS, WERE CONFINED ON ABOUT 120 HEALTHY SEEDLINGS, AND 41 PERCENT DEVELOPED MOSAIC. IN OTHER EXPERIMENTS THE BROWN APHID PREVIOUSLY MENTIONED WAS USED, AND CONCLUSIVE EVIDENCE WAS OBTAINED THAT IT CAN TRANSMIT MOSAIC, ALTHOUGH THE PERCENTAGE OF SUCCESSFUL TRANSFERS WAS MUCH SMALLER THAN WITH THE OTHER TWO SPECIES. A FEW TRANSMISSIONS WERE OBTAINED WITH STILL OTHER SPECIES OF APHIDS, BUT THE NUMBER OF EXPERIMENTS WITH THEM WAS SO SMALL THAT DEFINITE CONCLUSIONS ARE NOT JUSTIFIED.

THE COMMON YELLOW APHID OF SUGARCANE, SIPHA FLAVA FORBES, FAILED TO TRANSMIT MOSAIC IN NUMEROUS EXPERIMENTS.

INCIDENTAL OR TRANSIENT INSECT FEEDERS MAY BE IMPORTANT IN SPREADING DISEASE.

INSECTS THAT DO NOT NORMALLY FEED ON A PLANT MAY TRANSMIT DISEASE TO IT WHILE FEEDING ON IT TEMPORARILY DURING MIGRATION. THIS HAS BEEN SHOWN IN STUDIES OF CANE MOSAIC AND OF OTHER VIRUS DISEASES OF PLANTS. APHIDS SETTLE DOWN AND REPRODUCE ONLY ON THEIR CHOSEN HOST PLANT, BUT THEY WILL OFTEN FEED FOR A SHORT TIME ON ALMOST ANY PLANT THAT THEY ENCOUNTER DURING MIGRATION, AND THE WINGED INDIVIDUALS PRODUCED BY ALL APHID SPECIES HAVE AN INHERENT URGE TO WANDER. THEREFORE, ANY MIGRATORY INSECT, AND ESPECIALLY APHIDS, MAY BE SUSPECTED OF TRANSMITTING PLANT DISEASES.

THE APHIDS THAT TRANSMIT MOSAIC ARE WIDESPREAD IN PUERTO RICO.

THE CORN LEAF APHID, APHIS MAIDIS, HAS BEEN FOUND ALL OVER THE ISLAND ON SEVERAL GRASSES, BUT ONLY IN SMALL NUMBERS. IT HAS BEEN SEEN IN LARGE NUMBERS ONLY ON CORN IN THE TASSELED STAGE, AND WAS FOUND IN ABUNDANCE IN THE CORN-GROWING AREAS. SINGLE SPECIMENS WERE OCCASIONALLY OBSERVED ON CANE. A BROWN APHID, HYSTERONEURA SETARIAE, WAS ALSO FOUND IN MANY PLACES IN SMALL NUMBERS ON GRASSES, ESPECIALLY ON "PATA DE GALLINA", ELEUSINE INDICA. IN THE SOUTHERN COASTAL REGION IT WAS FOUND IN SMALL NUMBERS ON CANE AS WELL, BUT IN OTHER PARTS OF PUERTO RICO IT WAS RARELY SEEN ON CANE. IT IS REPORTED TO BE FREQUENTLY FOUND ON CANE IN LOUISIANA. THE BLACK APHID, CAROLINAIA CYPERI, WAS FOUND IN WIDELY SCATTERED LOCALITIES ON THE VERY COMMON "COQUI." ALL THREE OF THESE SPECIES CAN TRANSMIT MOSAIC. THE CORN LEAF APHID WAS MOST NUMEROUS IN THE RAINY SEASON, WHEREAS THE OTHER TWO SPECIES WERE MOST ABUNDANT IN THE DRY SEASON. MIGRATING APHIDS FROM OTHER PLANTS WERE FOUND ON CANE IN A FEW CASES; SOME OF THESE MAY TRANSMIT MOSAIC. THE SPREAD OF MOSAIC IS MORE RAPID IN CANE NEAR OTHER KINDS OF PLANTS THAN IN CANE FIELDS PLANTED SOLIDLY IN LARGE AREAS.

THE YELLOW APHID OF CANE, SIPHA FLAVA, IS ABUNDANT AND INJURIOUS.

THE YELLOW APHID OF SUGARCANE, SIPHA FLAVA, WAS FOUND IN ALL PARTS OF THE ISLAND, AT ALL SEASONS, AND ON ALL THE PRINCIPAL VARIETIES OF SUGARCANE. IT WAS

MOST ABUNDANT IN DRY WEATHER, AND AT TIMES SEEMED TO CAUSE CONSIDERABLE INJURY, ESPECIALLY TO YOUNG CANE. A REDDISH DISCOLORATION OF THE LEAVES WAS SEEN WHERE IT HAD FED. IT WAS FOUND ON SEVERAL GRASSES, BUT ONLY IN SMALL NUMBERS. ALL EVIDENCE TO DATE INDICATES THAT THE YELLOW CANE APHID DOES NOT TRANSMIT SUGARCANE MOSAIC.

OTHER INSECT PESTS ALSO WERE OBSERVED TO BE WIDESPREAD.

MEALYBUGS, PSEUDOCOCCUS SPP., WERE FOUND IN NEARLY ALL FIELDS. THEY BECAME VERY ABUNDANT ON OLD OR MATURE CANE AND WERE MORE NUMEROUS ON POJ 2878 THAN ON OTHER VARIETIES. MEALYBUGS MAY CAUSE MORE INJURY THAN IS GENERALLY BELIEVED. THE CANE BORER, DIATRAEA SP., WAS ALSO FOUND TO BE WIDESPREAD AND WAS INJURIOUS IN MANY FIELDS. A NUMBER OF OTHER INSECTS OF LESS IMPORTANCE WERE OBSERVED.

TABLE I.—THE LIBERATIONS OF PLAESIUS JAVANUS IN PUERTO RICO DURING 1936, GIVING LOCATIONS, DATES, AND NUMBER LIBERATED

LOCATIONS	DATES	NUMBERS LIBERATED
MAYAGUEZ, EXPERIMENT STATION, LAS OCHENTA	MARCH 2, 1936	250
JUANA DIAZ, FINCA JUAN RODRIGUEZ	MARCH 3, 1936	250
MAYAGUEZ, EXPERIMENT STATION, LAS OCHENTA	JUNE 16, 1936	37
TOTAL		537

DETERMINATION OF ESTABLISHMENT OF PREDATORY BEETLES MAY REQUIRE SOME YEARS.

THE FINDING OF EVIDENCE TO ESTABLISH THE PRESENCE OF THESE PREDATORY BEETLES IN PUERTO RICO MAY REQUIRE SOME YEARS. IN FIJI THE FACT THAT THIS PREDATOR HAD BECOME ESTABLISHED WAS NOT KNOWN UNTIL NEARLY 8 YEARS AFTER ITS LIBERATION. THESE PREDATORY BEETLES ARE LONG-LIVED AND A CONSIDERABLE PERIOD OF TIME IS NECESSARY FOR THEM TO COMPLETE THEIR LIFE CYCLE. THE PROGENY FROM THE ORIGINAL LIBERATIONS WILL THEREFORE BE IN THE LARVAL STAGE FOR A CONSIDERABLE PERIOD OF THE FIRST YEAR AND THEIR INCREASE AND SPREAD WILL NOT BE NOTICEABLE FOR SOME TIME AFTER THAT. IF CLIMATIC CONDITIONS ARE FAVORABLE, HOWEVER—AND THERE IS NO APPARENT REASON FOR BELIEVING OTHERWISE—THE ABUNDANCE OF BANANA WEEVIL HOSTS KNOWN TO BE PRESENT SHOULD GIVE IDEAL CONDITIONS FOR THESE PREDATORS TO BECOME ESTABLISHED.